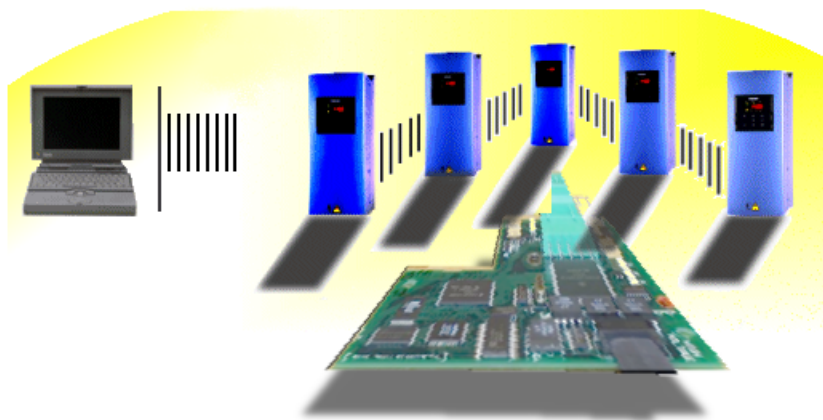


VACON
CX/CXL/CXS
FREQUENCY CONVERTERS



Vacon
DeviceNet
Option Board

Subject to changes without notice.

FOR SMOOTH CONTROL



vacon

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1. INTRODUCTION

DeviceNet is an open network based on CAN that is designed to allow low cost industrial control devices to communicate with each other. DeviceNet is defined in terms of an abstract object model which presents the suite of communication services available and describes the externally visible behaviour of a DeviceNet node. The DeviceNet Model is application independent. DeviceNet provides the communication services needed by various types of applications. Many of today's lower level industrial control devices must retain their low cost/low resource characteristics even when directly connected to a network. DeviceNet takes this into consideration by defining a specific instance of the Model for communications typically seen in a Master/Slave application. This is referred to as the Predefined Master/Slave Connection Set.

VACON drives can be connected to the DeviceNet using the CX212OPT fieldbus board. The drive can then be controlled, monitored and programmed from the Host system.

CX212OPT meets the requirements of the ODVA 2.0 specifications for the AC/DC Drives profile.

The DeviceNet board shall be installed in the space reserved for it inside the VACON frequency converter.

This instruction manual must be thoroughly read and understood before using the DeviceNet option board. Please keep this instruction manual in a safe place for future reference.

WARNING !



Internal components and circuit boards are at high potential when the drive is connected to the power source. This voltage is extremely dangerous and may cause death or severe injury if you come in contact with it.

2. SPECIFICATIONS

| | | |
|------------------------------|-------------------------------|---|
| DeviceNet Connections | Interface | Pluggable connector (5.08mm) |
| | Transfer method | CAN |
| | Transfer cable | 2 wire twisted shielded cable with 2 wire bus power cable and drain |
| | Electrical isolation | 500 V DC |
| Communications | ODVA 2.0 Compliant | |
| | Message types | IO Polling Explicit |
| | Baud rates | 125 Kbaud 250 Kbaud 500 Kbaud |
| | Product Code | 0x01 (1) |
| | Product Type | 0x02 (AC Drive) |
| | Vendor ID | 0x1BB (Vaasa Control) |
| Electrical | DeviceNet | Network supply voltage: 11...25 V DC Network input current: 28 mA typical, 125 mA inrush (24 V DC) |
| | Other | All other power derived from VACON inverter power supply |
| Environment | Ambient operating temperature | -10...55 °C |
| | Storage temperature | -40...60 °C |
| | Humidity | < 95%, no condensation allowed |
| | Altitude | Max. 1000 meters |
| | Vibration | 0.5 G at 9 – 200 Hz |
| Safety | | Fulfils EN50178 standard |

Table 1. CX212OPT DeviceNet Specification

3. INSTALLATION

3.1 Installation of the CX212OPT in Vacon CXS type frequency converter

The DeviceNet board shall be installed according to the instructions below (see table 3-1).

NOTE! These instructions apply only to field installations. Otherwise, the board has already been installed for you at the factory.

Before doing any commissioning, carefully read the safety instructions in the "VACON Frequency converter, User Manual" Chapter "SAFETY".

Verify receipt of all the DeviceNet board parts: **DeviceNet board (1)**, **data cable (blue terminal) (2)**, **fixing screw (3)**, **stand sleeve (4)**, **power cable (black terminal) (5)**, **protective plastic board (6)**, and **mounting board (7)**. See Figure below.

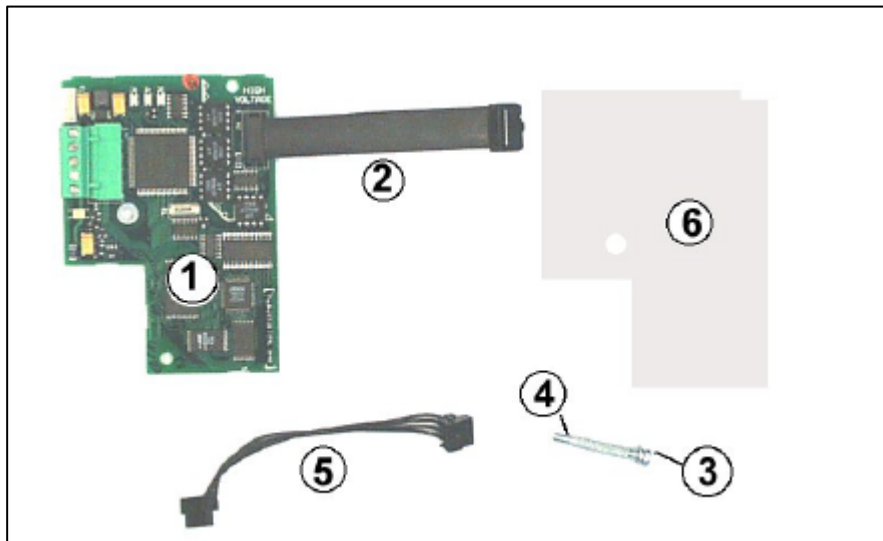

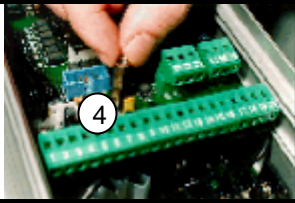
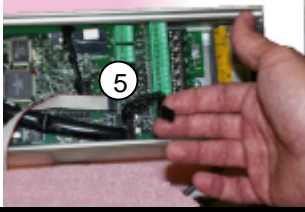
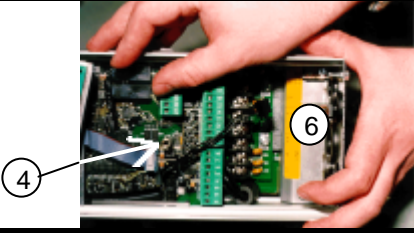
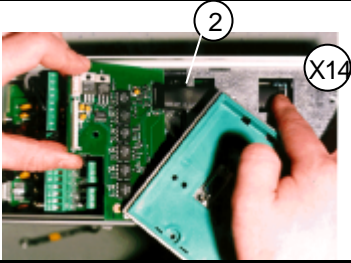
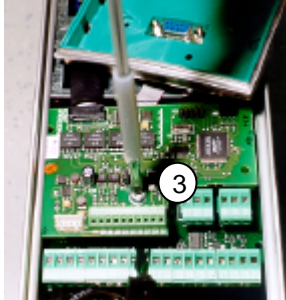


Figure 1. Components of the DeviceNet board

If the delivery does not correspond to your order, please contact the supplier immediately. Only a competent personnel should carry out the electrical installation.

Disconnect the VACON Frequency converter from the power source. Wait 5 minutes before opening the cover of the Drive.

| | | |
|----------|---|---|
| A | Remove the control panel and the panel base. |  |
| B | Remove the fixing screw from the control board and replace it with a stand sleeve (4). |  |
| C | Connect the power cable (5) to terminal X5 of the control board. The power cable can also be connected to terminal X6 if terminal X5 is already reserved by the power cable from the power board. |  |
| D | Remove the protective foil of the plastic board and place the plastic board (6) above the control board. Be sure to place the plastic board correctly so that the stand sleeve (4) comes out through the hole on the board. |  |
| E | Place the DeviceNet board (1) on the protective plastic board (6) and connect the data cable (2) to terminal X14 of the control board. The stand sleeve should come out through the metal-edged hole. |  |
| F | Secure the DeviceNet board on the stand sleeve with the screw (3) attached. |  |



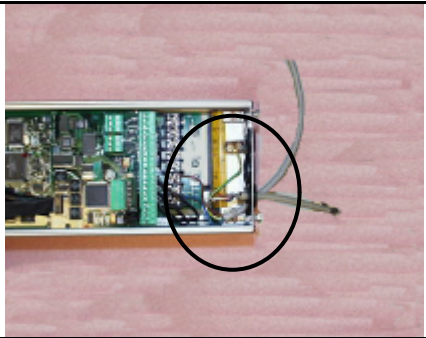
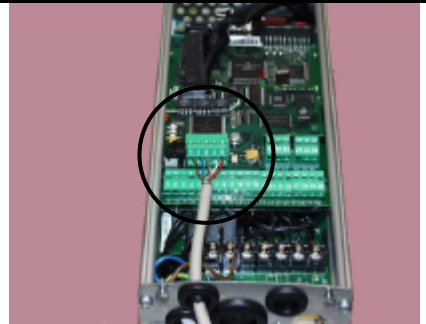
| | | |
|----------|---|---|
| G | Connect the power cable (5) to terminal X1 on the CX212OPT. |  |
| H | Attach the control panel base with four screws. |  |
| I | Check the connections. Remove all foreign objects inside the frequency converter. Restore back the control panel and drive cover. | |

Figure 2. Installation in Vacon CXS frequency converter

3.1.1. Connection of DeviceNet drop-line cable [Vacon CXS]

The following instructions lead you through the connection of the CX212OPT to the DeviceNet system, the power-up of the board and the grounding.

| | | |
|----------|--|--|
| A | Lead the DeviceNet drop-line cable through the upper left rubber-covered hole on the bottom of the VACON drive. |  |
| B | Connect the 4 colored wires into connector X4 in the following order from left: black, blue, NONE, white, red . Bend the bare cable in the middle backwards along the drop-line cable. See point C below. |  |

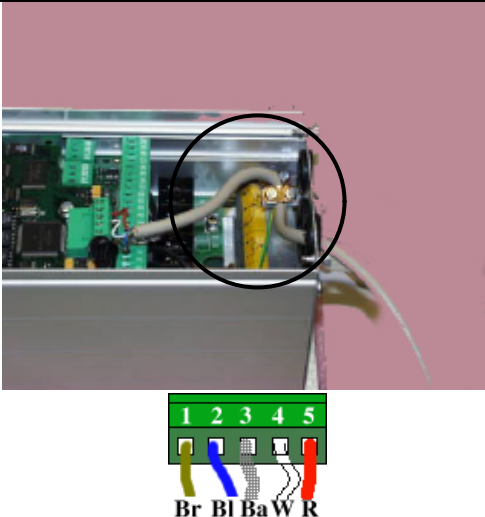
| | | |
|---|--|--|
| C | <p>There are two ways of grounding the DeviceNet drop-line cable.</p> <ol style="list-style-type: none"> 1) Bend the drop-line cable to a curve and ground it to the frame by fixing the cable lug around it at the stripped point, see picture on the right. This manner of grounding is recommended because it protects the device better from disturbances. 2) Connect the bare wire between the colored ones in terminal 3 as shown in picture on lower right. <p>NOTE: In case of several frequency drives in the DeviceNet system, only ONE of them shall be grounded according to 1). Grounding for the remaining devices shall take place according to 2).</p> |  |
|---|--|--|

Figure 3. Connection of the drop-line cable (Vacon CXS)

3.2. Installation of the CX212OPT in Vacon CX/CXL type frequency converters

The DeviceNet fieldbus board shall be installed according to the instructions below (see table 3-2).

NOTE! These instructions apply only to field installations. Otherwise, the board has already been installed for you at the factory.

Before doing any commissioning, carefully read the safety instructions in the "VACON Frequency converter, User's Manual" Chapter "SAFETY".

Verify receipt of all the DeviceNet board parts: **DeviceNet board (1)**, **data cable (blue terminal) (2)**, **fixing screw (3)**, **stand sleeve (4)**, **power cable (black terminal) (5)**, **protective plastic board (6)**, and **mounting board (7)**. See Figure below.

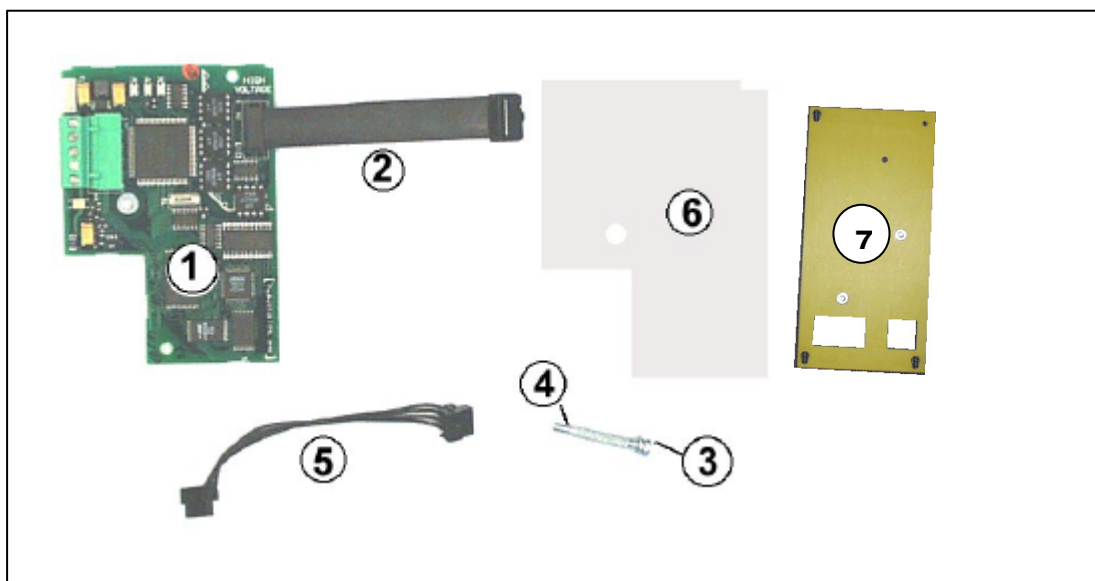


Figure 4. Components of Vacon DeviceNet board (CX/CXL)


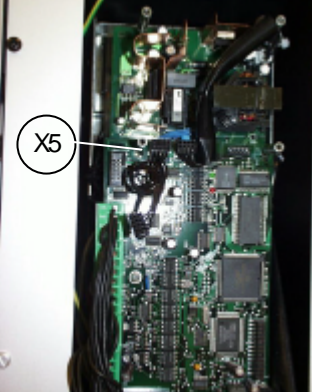
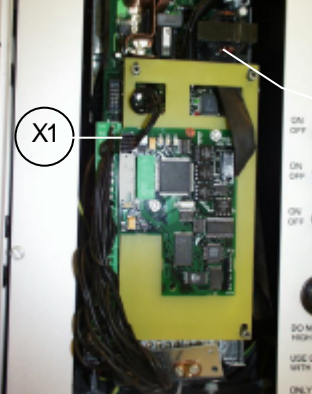

| | | |
|----------|---|---|
| A | Fix the DeviceNet fieldbus board (1) on the mounting board (7) with the two screws attached. Make sure that the installation is stable |  |
| B | Connect the other end of the power cable (5) to terminal X5 of the control board. The power cable can also be connected to terminal X6 if terminal X5 is already reserved by the power cable from the power board |  |
| C | Lead the power cable (5) through the smaller opening and connect it to terminal X1 on the CX212OPT. Put also the data cable (2) through the larger opening and connect it to terminal X14 of the control board. Place the mounting board (7) with the CX212OPT above the control board by the three stand-offs. |  |
| D | Push the mounting board (7) downwards so that the narrow parts of the holes in the board hit the slots on parts of the stand-offs. Fix the mounting board (7) with a screw at the lower left angle. |  |

Figure 5. Installation of the DeviceNet board in Vacon CX/CXL type frequency converters

3.2.1. Connection of DeviceNet drop-line cable [CX/CXL]

The following instructions lead you through the connection of the CX212OPT to the DeviceNet system, the power-up of the board and the grounding.



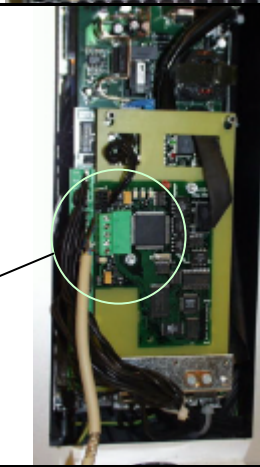

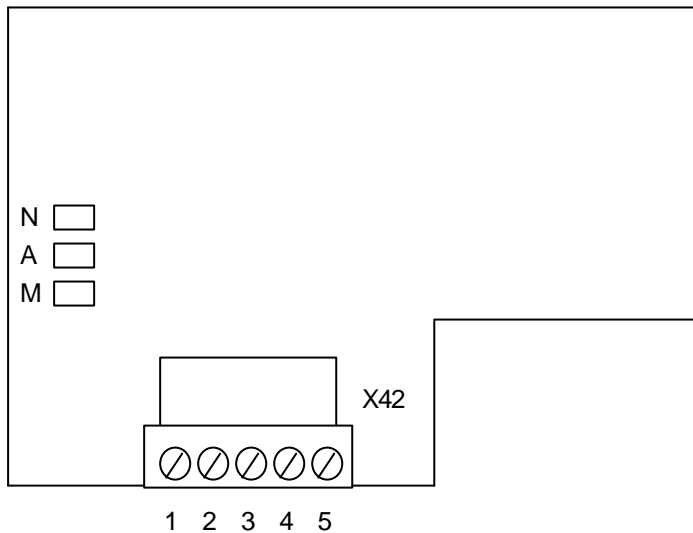
| | | |
|---|---|---|
| A | Lead the DeviceNet drop-line cable through the upper left rubber-covered hole on the bottom of the VACON drive. |  |
| B | <p>Connect the 4 coloured wires into connector X4 in the following order from left: black, blue, NONE, white, red. Bend the bare cable in the middle backwards along the drop-line cable. See point C below</p>  |  |
| C | <p>There are two ways of grounding the DeviceNet drop-line cable.</p> <ol style="list-style-type: none"> 1) Bend slightly the drop-line cable and ground it to the frame by fixing the cable lug around it at the stripped part. See picture on the right. This way of grounding is recommended because it protects the device better from disturbances. 2) Connect the bare wire (see point B) between the coloured ones to terminal 3 as shown in picture on lower right. <p>NOTE: In case of several frequency drives in the DeviceNet system, only ONE of them shall be grounded according to 1). Grounding for the remaining devices shall take place according to 2).</p> |  |

Figure 6. Connection of the drop-line cable (Vacon CX/CXL).

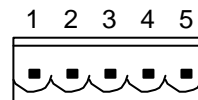
4. CONNECTIONS

4.1. Board layout



DeviceNetConnector (X4):

| | | |
|---|-------|-------|
| 1 | V- | Black |
| 2 | CAN_L | Blue |
| 3 | Drain | Bare |
| 4 | CAN_H | White |
| 5 | V+ | Red |



Diagnostic LED:

| | |
|---|--------------------------------------|
| N | Network Status, bi-color (red/green) |
| A | Node Address, bi-color (red/green) |
| M | Module Status, bi-color (red/green) |

LED Definitions see chapter 6.1

5. CONFIGURATION

FIRST READ HOW TO COMMISSION THE DRIVE IN THE VACON DRIVE USER'S MANUAL (CHAPTER 8.)

Commissioning of the DeviceNet board:

Check that Multi-purpose Control Application II (or e.g. Fieldbus Application) is selected.

- Parameter P0.1 = 0

For further information about the use of parameters, see VACON Drive User's Manual, Chapter 7. More information on the loading and saving of system parameters can be found in the VACON Drive User's Manual, Chapter 11.

Set active control source to DeciveNet:

1. Check that the control panel is not the active control source.
(See VACON Drive User's manual, Chapter 7.)
2. Check that parameter 10.1 "Fieldbus control select" is set to value 1(On).

DeviceNet Configuration Tool

Before using the CX212OPT option board, you must configure the device baud rate and node address to the desired values. This can be accomplished by using a DeviceNet configuration tool (Cutler-Hammer "Netview", Allen Bradley "DeviceNet Manager", etc.). The default baud rate and node address is 125 Kbaud and 63, respectively. All devices must have the same baud rate.

Since all new devices are factory set to node address 63, it is usually not a good idea to leave the address set to 63.

You must also check or set following attributes before use:

Basic and Motor Control Class (160) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|------------|--|---|---------------------------------|--------------|--|
| 26 0x1A | Polled Input As- sembly Type | Get_Attribute_Single, Set_Attribute_Single | 71 70 73 | C7 | Input assembly used by the polled con- nection |
| 27 0x1B | Polled Output As- sembly Type | Get_Attribute_Single, Set_Attribute_Single | 21 20 23 | C7 | Output assembly used by the polled con- nection |

Protection Class (166) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|----------------------|---|---------------------------------|--------------|---|
| 151 0x97 | SafeStateType | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C6 | Selects Safe State response to errors which specify safe state operation. Currently only a loss of connection other than by de-allocation is a safe state error. Warning: Review the application for safe operation before specifying a value for this attribute. 0 = DriveFault (fault and stop) 1 = No Action (hold last speed) 2 = Preset Speed/Direction |
| 152 0x98 | PresetDir | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C1 | Sets safe state direction of rotation if the Safe State Behavior attribute specifies "Preset Speed/Direction". Warning: Review the application for safe operation before specifying a value for this attribute. Inverter will require external stop. 0 = Forward 1 = Reverse |
| 153 0x99 | PresetRPM | Get_Attribute_Single, Set_Attribute_Single | 0 0 30000 | C7 | Sets safe state speed reference (RPM) if the Safe State Behavior attribute specifies "Preset Speed/Direction". Warning: Review the application for safe operation before specifying a value for this attribute. Inverter will require external stop. |
| 154 0x9A | PresetTq | Get_Attribute_Single, Set_Attribute_Single | 0 0 10000 | C7 | Sets safe state torque reference (0,00%) if the Safe State Behavior attribute specifies "Preset Speed/Direction". Warning: Review the application for safe operation before specifying a value for this attribute. Inverter will require external stop. |

6. VACON DEVICENET INTERFACE

Features of the VACON DeviceNet Interface:

- Direct control of VACON (e.g. Run, Stop, Direction, Speed reference, Fault reset)
- Full access to all VACON parameters
- Monitor VACON status (e.g. Output frequency, Output current, Fault code)

6.1. LED definitions and diagnostic

The CX212OPT includes three LED status indicators: Module status, Node address and Network status. Module Status (**M**) provides information about the DeviceNet module. Network Status (**N**) provides information about the status of the network connection.

Module Status LED

| LED | Meaning |
|----------------|--|
| Off | There is no power applied to the CX212OPT. |
| Green | The CX212OPT is operating normally. |
| Flashing Green | The CX212OPT is in the Standby state, or the device needs commissioning due to configuration missing, incomplete or incorrect. |
| Flashing Red | The CX212OPT has detected a Recoverable Fault |
| Red | The CX212OPT has detected an Unrecoverable Fault. |

Network Status LED

| LED | Meaning |
|----------------|--|
| Off | CX212OPT is not on-line. - The device has not completed the Dup_MAC_ID test yet. - If the Module Status LED is off, the device is not powered. |
| Green | The CX212OPT is on-line and allocated to a Master. |
| Flashing Green | The CX212OPT has passed the Dup_MAC_ID test, is on-line, but is not allocated to a master. |
| Flashing Red | One or more I/O Connections are in the Timed-Out state. |
| Red | The CX212OPT cannot communicate on the network (Duplicate MAC ID, or Bus-off). |

The Node Address (**A**) LED blinks the MAC ID of the unit while it is powered. The unit displays the tens digit with red blinks, and the ones digits with green blinks. The unit plays the tens, then ones, and finally delays about 2 second before repeating the sequence.

An LED test is performed at power-up. The following sequence performed:

1. All LED's off
2. All LED's green (0.25 s)
3. All LED's red (0.25 s)
4. All LED's off
5. Start of normal operation

6.2. Reset Service

The following table lists the different types of resets supported by the Identity Object.

Resetting the CX212OPT interface to its out-of-box configuration will set ALL attributes to their default values and change the response of the drive to a loss of communications with the CX212OPT. The device will have to be re-configured for your application before resuming normal operation.

Resetting the VACON inverter to its out-of-box configuration will set ALL inverter parameters to their default values. Before restarting the inverter, you must verify that it is properly configured for your application.

| Value: | Type of Reset: |
|--------|--|
| 0 | Emulate as closely as possible the cycling of power to the CX212OPT DeviceNet Interface. This value is the default if this parameter is omitted. The VACON drive shall be stopped if it is running. |
| 1 | Return the CX212OPT DeviceNet Interface AND the VACON Drive as closely as possible to the out-of-box (C-H factory default) configuration, then emulate cycling of power as closely as possible. The VACON Drive shall be stopped if it is running. |

6.3. Message Types

The CX212OPT allows an VACON Frequency converter to operate as a slave device on a DeviceNet network. The CX212OPT supports Explicit Messages and Polled I/O Messages of the predefined master/slave connection set. It *does not* support the Explicit Unconnected Message Manager (UCMM).

As a group 2 slave device, the CX212OPT supports the following message types.

| CAN Identifier Field | Group 2 Message Type |
|----------------------|---------------------------------------|
| 10xxxxxx111 | Duplicate MAC ID Check Messages |
| 10xxxxxx110 | Unconnected Explicit Request Messages |
| 10xxxxxx101 | Master I/O Poll Command Messages |
| 10xxxxxx100 | Master Explicit Request Messages |
| 10xxxxxx011 | Slave Explicit Response Messages |
| 01111xxxxxx | Slave Poll Response Messages |

xxxxxx = Communication Interface Node Address

6.4. List of Object Classes

The Communication Interface supports the following object classes.

| Class | Object |
|-------|----------------------------|
| 0x01 | Identity |
| 0x02 | Message Router |
| 0x03 | DeviceNet |
| 0x04 | Assembly |
| 0x05 | DeviceNet Connection |
| | |
| 0x28 | Motor Data |
| 0x29 | Control Supervisor |
| 0x2A | AC/DC Drive |
| | |
| 0xA0 | Basic and Motor Control |
| 0xA1 | Input and Fieldbus Control |
| 0xA2 | Output and Supervision |
| 0xA3 | Drive and Torque Control |
| 0xA6 | Protections |
| 0xAA | Monitoring Data |

6.5. List of Services

The Services supported by these object classes are shown below.

| Service Code (in hex) | Service Name | Identity | | Message Router | | DeviceNet | | Assembly | | Connection | | Motor Data | | Control Supervisor | | AC/DC Drive | | Objects | |
|--------------------------|--------------------------------------|----------|------|----------------|------|-----------|------|----------|------|------------|------|------------|------|--------------------|------|-------------|------|---------|------|
| | | Class | Inst | Class | Inst | Class | Inst | Class | Inst | Class | Inst | Class | Inst | Class | Inst | Class | Inst | Class | Inst |
| 05 | Reset (Type 0, 1) | | Y | | | | | | | | Y | | | | | | | | |
| 0E | Get_Attribute_Single | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| 10 | Set_Attribute_Single | | Y | | Y | | Y | | Y | | Y | | Y | | Y | | Y | | Y |
| 14 | Error Response | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| 18 | Get Member | Y | | Y | | Y | | Y | | Y | | Y | | Y | | Y | | Y | |
| 4B | Allocate_Master/Slave_Connection_Set | | | | | | Y | | | | | | | | | | | | |
| 4C | Release_Master/Slave_Connection_Set | | | | | | Y | | | | | | | | | | | | |
| Vendor Specific Services | | | | | | | | | | | | | | | | | | | |
| 47 | CH Get Member | Y | | Y | | Y | | Y | | Y | | Y | | Y | | Y | | Y | |

6.6. List of Data Types

The attribute list that follows includes information on the Data Type of each attribute. The following tables explain the Data, Structure, and Array Type codes used in the Data Type column. For further information see Appendix J of the ODVA DeviceNet specification 2.0

Elementary Data Types

| Data Type Name | Data Type Code (in hex) | Data Type Description |
|----------------|-------------------------|---|
| BOOL | C1 | Logical Boolean with values TRUE and FALSE |
| SINT | C2 | Signed 8-bit integer value |
| INT | C3 | Signed 16-bit integer value |
| USINT | C6 | Unsigned 8-bit integer value |
| UINT | C7 | Unsigned 16-bit integer value |
| UDINT | C8 | Unsigned 32-bit integer value |
| BYTE | D1 | bit string - 8-bits |
| WORD | D2 | bit string - 16-bits |
| SHORT_STRING | DA | character sting (1 byte per character, 1 byte length indicator) |

Constructed Data Types

| Type Code | Description |
|-----------|---------------------------------|
| A1 | Abbreviated array type encoding |
| A2 | Formal structure type encoding |
| | |

Appendix 1

VACON DeviceNet Interface Errors

The CX212OPT DeviceNet interface record the following events in the Event List FIFO:

| VACON Event Name | Event Code | Event Description |
|---|------------|--|
| No event | 0x00 | Default value in EventList entries. |
| Drive Communication Error | 0x01 | Inverter interface communication error with the drive. |
| I/O Connection Timeout – Fault_Stop | 0x02 | Control Supervisor transitions to Fault_Stop. |
| I/O Connection Timeout – No Action | 0x03 | Control Supervisor remains in Enabled State. Hold last speed |
| I/O Connection Timeout – Preset Direction and Speed | 0x04 | Control Supervisor remains in Enabled State. Run at preset direction and speed. |
| Explicit Connection Timeout – Fault_Stop | 0x05 | Control Supervisor transitions to Fault_Stop. |
| Explicit Connection Timeout – No Action | 0x06 | Control Supervisor remains in Enabled State. Hold last speed |
| Explicit Connection Timeout – Preset Direction and Speed | 0x07 | Control Supervisor remains in Enabled State. Run at preset direction and speed. |
| Low DeviceNet Voltage | 0x08 | Connection timeout may occur next. |
| Bus Off | 0x09 | Connection timeout may occur next. |
| CAN Overrun | 0x0C | Connection timeout may occur next. |
| Configuration Consistency Value (CRC) mismatch | 0x0E | The device's configuration is incorrect or incomplete. Major Recoverable Fault. An Identity Reset type 1 is needed for recovery. |
| Microprocessor watchdog timeout | 0x0F | The device detected a serious problem with itself. Major Unrecoverable Fault. |
| Received explicit message is too big | 0x10 | Message is ignored. |
| Received IO message is too big | 0x11 | Message is ignored. |
| Parameter Range Error | 0x12 | An out-of-range parameter value exists in the drive. |
| I/O Connection Released – Fault_Stop | 0x14 | Control Supervisor transitions to Fault_Stop. |
| I/O Connection Released – No Action | 0x15 | Control Supervisor remains in Enabled State. Hold last speed |
| I/O Connection Released – Preset Direction and Speed | 0x16 | Control Supervisor remains in Enabled State. Run at preset direction and speed. |
| Receive_Idle – Fault_Stop | 0x17 | Control Supervisor transitions to Fault_Stop. |
| Receive_Idle – No Action | 0x18 | Control Supervisor remains in Enabled State. Hold last speed |
| Receive_Idle – Preset Direction and Speed | 0x19 | Control Supervisor remains in Enabled State. Run at preset direction and speed. |
| Explicit Connection Released – Fault_Stop | 0x1A | Control Supervisor transitions to Fault_Stop. |
| Explicit Connection Released – No Action | 0x1B | Control Supervisor remains in Enabled State. Hold last speed |
| Explicit Connection Released – Preset Direction and Speed | 0x1C | Control Supervisor remains in Enabled State. Run at preset direction and speed. |
| Connection unable to read message | 0x21 | Error detected by connection object code |
| Connection unable to send message | 0x22 | Error detected by connection object code |
| Consumer unable to read message | 0x23 | Error detected by connection object code |
| Producer unable to send message | 0x24 | Error detected by connection object code |
| Producer unable to send buffer | 0x25 | Error detected by connection object code |
| Producer unable to send acknowledgment | 0x26 | Error detected by CX212OPT connection object code |
| Unexpected notification that message was | 0x27 | Error detected by connection object code |

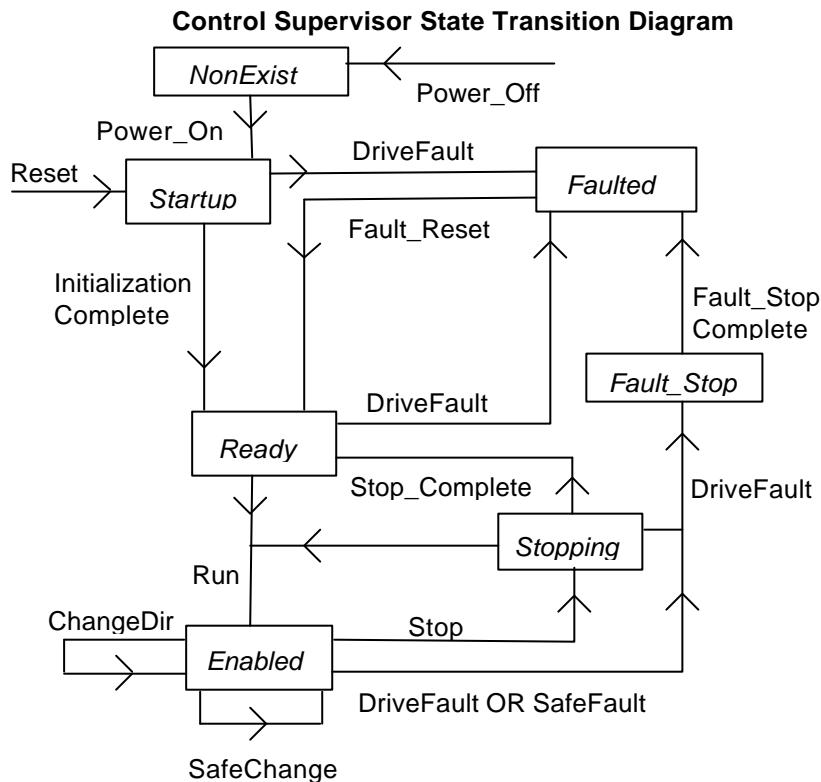
| | | |
|---|------|--|
| sent | | |
| Explicit reply is too big | 0x31 | Error detected by connection object code |
| First fragment of an IO message is too big | 0x34 | Error detected by connection object code |
| Reassembled IO message is too big | 0x35 | Error detected by connection object code |
| IO message is too big for producer | 0x36 | Error detected by connection object code |
| IO/Explicit message is too big for producer | 0x37 | Error detected by connection object code |

Appendix 2

Control Supervisor Behaviour

Control Supervisor State Transition Diagram

The State Transition Diagram provides a graphical description of the states and corresponding state transitions for the control supervisor.



Control Supervisor State Transition Diagram Explanation

| Old State | Input Conditions | | | | | | Event | New State | Results |
|---------------------------|------------------|---------|---------|----------|---------|---------|-------------------------|------------|--|
| | CtrlFromNet | Run1Var | Run2Var | IdleMode | FwdMode | RevMode | | | |
| x | x | x | x | x | x | x | Power_Off | NonExist | |
| x (except NonExist) | x | x | x | x | x | x | Reset | Startup | Faulted := 0; Ready := 0 FwdMode := 0; RevMode := 0 Run1Var := 0; Run2Var := 0 |
| NonExist | x | x | x | x | x | x | Power_On | Startup | Faulted := 0; Ready := 0 FwdMode := 0; RevMode := 0 Run1Var := 0; Run2Var := 0 |
| Startup | x | x | x | x | x | x | DriveFault | Faulted | Faulted := 1; FaultCode := x |
| Startup | x | x | x | x | x | x | Initialization Complete | Ready | Ready := 1 |
| Ready | x | x | x | x | x | x | DriveFault | Faulted | Faulted := 1; FaultCode := x; Ready := 0 |
| Ready | 1 | 1 | 0 | 0 | x | x | Run (Fwd) | Enabled | FwdMode := 1 (Start Forward) |
| Ready | 1 | 0 | 1 | 0 | x | x | Run (Rev) | Enabled | RevMode := 1 (Start Reverse) |
| Enabled | x | x | x | x | x | x | DriveFault | Fault_Stop | Faulted := 1; FaultCode := x (Initiate Faulted Stop) FwdMode := 0; RevMode := 0; Ready := 0 |
| Enabled | 1 | 0 | 0 | x | x | x | Stop | Stopping | (Initiate Stop) |
| Enabled | 1 | 1 | 0 | 0 | 0 | 1 | ChangeDir (Fwd) | Enabled | FwdMode := 1; RevMode := 0 (Change to Forward) |
| Enabled | 1 | 0 | 1 | 0 | 1 | 0 | ChangeDir (Rev) | Enabled | FwdMode := 0; RevMode := 1 (Change to Reverse) |
| Enabled | 1 | x | x | x | x | x | SafeFault | Fault_Stop | Faulted := 1; FaultCode := x (Initiate Faulted Stop) FwdMode := 0; RevMode := 0; Ready := 0 Run1Var := 0; Run2Var := 0 |
| Enabled | 1 | x | x | x | x | x | SafeChange | Enabled | FwdMode := Run1Var := NOT PresetDir RevMode := Run2Var := PresetDir SpeedRef := PresetSpeed TorqueRef := PresetTorque |
| Stopping | x | x | x | x | x | x | DriveFault | Fault_Stop | Faulted := 1; FaultCode := x (Initiate Faulted Stop) Ready := 0 |
| Stopping | 1 | 1 | 0 | 0 | x | x | Run (Fwd) | Enabled | FwdMode := 1 (Start Forward) |
| Stopping | 1 | 0 | 1 | 0 | x | x | Run (Rev) | Enabled | RevMode := 1 (Start Reverse) |
| Stopping | x | 0 | 0 | x | x | x | Stop_Complete | Ready | |
| Fault_Stop | x | x | x | x | x | x | Fault_Stop Complete | Faulted | |
| Faulted | x | x | x | x | x | x | Fault_Reset | Ready | Faulted := 0; Ready := 1 |

Start Forward, Start Reverse, Change to Forward, Change to Reverse, and Stop (not Faulted Stop) are static outputs of the Control Supervisor state machine. They are commands to the drive when CtrlFromNet=1. When CtrlFromNet=0, control commands are from another source.

Other logic equations:

RefFromNet = (NetRef) AND (EnableFieldbus);

IF (RefFromNet)

```
{
  (Write reference frequency or torque to the drive whenever SpeedRef or TorqueRef are written.)
}
```

When performing changes to achieve programmed Safe State:

- (1) Run/Stop/Direction can be changed because CtrlFromNet must equal 1 when in the Enabled state.
- (2) Reference in the drive can be changed to PresetSpeed or PresetTorque only if (RefFromNet = 1).

Appendix 3

Input and Output Assemblies

Output 20

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|--------|-----------------------------|-------|-------|-------|-------|------------|-------|--------|
| Byte 0 | | | | | | FaultReset | | RunFwd |
| Byte 1 | | | | | | | | |
| Byte 2 | Speed Reference (Low Byte) | | | | | | | |
| Byte 3 | Speed Reference (High Byte) | | | | | | | |

Output 21 (Default)

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|--------|-----------------------------|--------|---------|-------|-------|------------|--------|--------|
| Byte 0 | | NetRef | NetCtrl | | | FaultReset | RunRev | RunFwd |
| Byte 1 | | | | | | | | |
| Byte 2 | Speed Reference (Low Byte) | | | | | | | |
| Byte 3 | Speed Reference (High Byte) | | | | | | | |

Output 23

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|--------|------------------------------|--------|---------|-------|-------|------------|--------|--------|
| Byte 0 | | NetRef | NetCtrl | | | FaultReset | RunRev | RunFwd |
| Byte 1 | | | | | | | | |
| Byte 2 | Speed Reference (Low Byte) | | | | | | | |
| Byte 3 | Speed Reference (High Byte) | | | | | | | |
| Byte 4 | Torque Reference (Low Byte) | | | | | | | |
| Byte 5 | Torque Reference (High Byte) | | | | | | | |

Input 70

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|--------|--------------------------|-------|-------|-------|-------|----------|-------|---------|
| Byte 0 | | | | | | Running1 | | Faulted |
| Byte 1 | | | | | | | | |
| Byte 2 | Speed Actual (Low Byte) | | | | | | | |
| Byte 3 | Speed Actual (High Byte) | | | | | | | |

Input 71 (Default)

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|--------|--------------------------|------------|-------------|-------|----------|----------|---------|---------|
| Byte 0 | AtReference | RefFromNet | CtrlFromNet | Ready | Running2 | Running1 | Warning | Faulted |
| Byte 1 | Drive State | | | | | | | |
| Byte 2 | Speed Actual (Low Byte) | | | | | | | |
| Byte 3 | Speed Actual (High Byte) | | | | | | | |

Input 73

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|--------|---------------------------|------------|-------------|-------|----------|----------|---------|---------|
| Byte 0 | AtReference | RefFromNet | CtrlFromNet | Ready | Running2 | Running1 | Warning | Faulted |
| Byte 1 | Drive State | | | | | | | |
| Byte 2 | Speed Actual (Low Byte) | | | | | | | |
| Byte 3 | Speed Actual (High Byte) | | | | | | | |
| Byte 4 | Torque Actual (Low Byte) | | | | | | | |
| Byte 5 | Torque Actual (High Byte) | | | | | | | |

Appendix 4

CX212OPT Communication Interface Object Profiles

In the following list, attributes shown in **bold** are stored in the non-volatile memory of the CX212OPT or VACON drive and maintain their values after a power loss. All other settable attributes will power up at their default values.

Attributes listed in the **shaded area** in the following list must be set during the configuration of the CX212OPT while it is connected to a VACON drive. These attributes must be stored in non-volatile memory to maintain their values after power loss.

Before operating over DeviceNet, NetCtrl (Control Supervisor Object Class 41, Instance 1, Attribute 5) must be set to 1, "Network Control". Setting the speed of the drive over DeviceNet requires that NetRef (AC/DC Drive Object Class 42, Instance 1, Attribute 4) be set to 1, "Reference is From Network".

Identity Object

Class Code 0x01

Identity Class (1) – Class attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Identity" "Identity" "Identity" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance IDs supported by this class |

Identity Class (1) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|----------------|----------------------|---------------------------------|--------------|---|
| 1 0x01 | Vendor Id | Get_Attribute_Single | 443 443 443 | C7 | Identification of each vendor by number |
| 2 0x02 | Device Type | Get_Attribute_Single | 2 2 2 | C7 | Indication of the general type of product |
| 3 0x03 | Product Code | Get_Attribute_Single | 1 1 1 | C7 | This is a code assigned by the vendor to describe the device. Product code determined by interrogating the connected drive. |

| | | | | | |
|-------------|--|---|----------------------------------|-------------|---|
| 4 0x04 | Revision | Get_Attribute_Single | {1,11} {1,11} {1,11} | A2 02 C6 C6 | Revision of the item the Identity Object represents |
| 5 0x05 | Status | Get_Attribute_Single | N/A 0 255 | D2 | Summary Status of the Device. Defined in ODVA DeviceNet spec. Bit 5 = User fault Bit 6 = Node fault Bit 7 = System fault |
| 6 0x06 | Serial Number | Get_Attribute_Single | N/A 0x30940000 0x37FFFFFF | C8 | Serial Number of the device |
| 7 0x07 | Product Name | Get_Attribute_Single | "212OPT" "212OPT" "212OPT" | DA | Human readable identification |
| 8 0x08 | State | Get_Attribute_Single | N/A 0 5 | C6 | Present state of the device as represented by the state transition diagram. 0 = Nonexistent 1 = Device Self Testing 2 = Standby 3 = Operational 4 = Major Recoverable Fault 5 = Major Unrecoverable Fault |
| 9 0x09 | Configuration Consistency Value | Get_Attribute_Single | N/A 0 65535 | C7 | Contents identify configuration of device |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Message Router Object

Class Code 0x02

Message Router Class (2) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|-------------------------|----------------------|---------------------------------|----------------------|-------------------------|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |

| | | | | | |
|-------------|---------------------------|------------------------------|--|-------------------------------------|---|
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Message Router" "Message Router" "Message Router" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service.F97 |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance IDs supported by this class |

Message Router Class (2) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|-------------------|---|---------------------------------|----------------------|--|
| 1 0x01 | Object List | Get_Attribute_Single | N/A N/A N/A | A2 04 C7 A1 01 C7 | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

DeviceNet Object

Class Code 0x03

DeviceNet Class (3) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|------------------------------|---|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 2 2 2 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "DeviceNet" "DeviceNet" "DeviceNet" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance IDs supported by this class |

DeviceNet Class (3) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|-------------------------|---|---------------------------------|--------------|---|
| 1 0x01 | MAC ID | Get_Attribute_Single, Set_Attribute_Single | 63 0 63 | C6 | Node Address. |
| 2 0x02 | Baud Rate | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C6 | The baud rate of the device. 00 = 125K 01 = 250K 02 = 500K |
| 3 | BOI [Bus Off Interrupt] | Get_Attribute_Single, | 1 | C1 | |

| | | | | | |
|------|--|----------------------|---|--|--|
| 0x03 | | Set_Attribute_Single | 0 | | |
|------|--|----------------------|---|--|--|

| | | | | | |
|------|-----------------------------|---|-------------------|-------------|---|
| | | | 1 | | |
| 4 | Bus-off Counter | Get_Attribute_Single, | 0 | C6 | |
| 0x04 | | Set_Attribute_Single | 0 | | |
| | | | 255 | | |
| 5 | 0x05 Allocation Information | Get_Attribute_Single | N/A N/A N/A | A2 02 D1 C6 | Allocation Choice Master's Mac ID Struct of: |
| | | | | | BYTE: Allocation Choice byte |
| | | | | | Bit 0 = explicit messaging |
| | | | | | Bit 1 = Polled I/O |
| | | | | | USINT: Master's Mac ID |
| | | | | | 0-63 valid |
| | | | | | 255 = unallocated |
| 100 | Bus-off Separation | Get_Attribute_Single, | 50 | C6 | |
| 0x64 | | Set_Attribute_Single | 0 255 | | |
| 176 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |
| 0xB0 | | | | | |

Assembly Object

Class Code 0x04

Assembly Class (4) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 2 2 2 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 73 73 73 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 6 6 6 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Assembly" "Assembly" "Assembly" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance IDs supported by this class |

Assembly Class (4) – Basic Control (20)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|-------------------|---|---------------------------------|-------------------------|--|
| 3 0x03 | Data | Get_Attribute_Single | N/A N/A N/A | A2 05 A1 01 C1 D1 C3 | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Assembly Class (4) – Speed Control (21)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|---|----------------|----------|---------------------------------|--------------|-------------|
|---|----------------|----------|---------------------------------|--------------|-------------|

| | | | | | |
|-------------|-------------------|---|---------------------|-------------------------|---|
| 3 0x03 | Data | Get_Attribute_Single | N/A N/A N/A | A2 05 A1 01 C1 D1 C3 | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A, N/A, N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Assembly Class (4) – Torque Control (23)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|-------------------|---|---------------------------------|-------------------------|---|
| 3 0x03 | Data | Get_Attribute_Single | N/A N/A N/A | A2 05 A1 01 C1 D1 C3 | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Assembly Class (4) - Basic Status (70)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|-------------------|---|---------------------------------|-------------------------|---|
| 3 0x03 | Data | Get_Attribute_Single | N/A N/A N/A | A2 05 A1 01 C1 D1 C3 | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Assembly Class (4) - Speed Status (71)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|-------------------|---|---------------------------------|-------------------------|---|
| 3 0x03 | Data | Get_Attribute_Single | N/A N/A N/A | A2 05 A1 01 C1 D1 C3 | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Assembly Class (4) - Torque Status (73)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|-------------------|---|---------------------------------|-------------------------|---|
| 3 0x03 | Data | Get_Attribute_Single | N/A N/A N/A | A2 05 A1 01 C1 D1 C3 | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

DeviceNet Connection Object

Class Code 0x05

DeviceNet Connection Class (5) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 2 2 2 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 2 2 2 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "DeviceNet Connection" "DeviceNet Connection" "DeviceNet Connection" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance IDs supported by this class |

DeviceNet Connection Class (5) - Explicit Connection Instance (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|-------------------------|----------------------|---------------------------------|--------------|--|
| 1 0x01 | State | Get_Attribute_Single | 0 0 5 | C6 | State of the object |
| 2 0x02 | Instance Type | Get_Attribute_Single | 0 0 0 | C6 | Indicates either I/O or messaging connection 0=Explicit |
| 3 0x03 | Transport Class Trigger | Get_Attribute_Single | 0x83 0x83 0x83 | D1 | Defines Behavior of the connection |
| 4 0x04 | Produced Connection Id | Get_Attribute_Single | N/A 0x403 | C7 | Placed in CAN Identifier Field when the Connection Transmits |

| | | | | | |
|-------------|---------------------------------|---|-----------------------|----------|---|
| | | | 0x5FB | | |
| 5 0x05 | Consumed Connection Id | Get_Attribute_Single | N/A 0x404 0x5FC | C7 | CAN Identifier Field value that denotes message to be received |
| 6 0x06 | Initial Comm Characteristics | Get_Attribute_Single | 0x21 0x21 0x21 | D1 | Defines the Message Group(s) across which productions and consumptions associated with this |
| 7 0x07 | Produced Connection Size | Get_Attribute_Single | 41 41 41 | C7 | Maximum number of bytes transmitted across this Connection |
| 8 0x08 | Consumed Connection Size | Get_Attribute_Single | 41 41 41 | C7 | Maximum number of bytes received across this Connection |
| 9 0x09 | Expected Packet Rate | Get_Attribute_Single, Set_Attribute_Single | 2500 0 65535 | C7 | Defines timing associated with this Connection |
| 12 0x0C | Watchdog Timeout Action | Get_Attribute_Single, Set_Attribute_Single | 1 1 3 | C6 | Defines how to handle Inactivity/Watchdog timeouts. 1-Auto Delete 3-Deferred Delete An attempt to set this attribute to the value 2 will result in an Invalid Attribute Value error. |
| 13 0x0D | Produced Connection Path Length | Get_Attribute_Single | 0 0 0 | C7 | Number of bytes in the produced_connection_path length attribute |
| 14 0x0E | Produced Connection Path | Get_Attribute_Single | N/A N/A N/A | A1 01 C6 | Application Obj. producing data on this connection |
| 15 0x0F | Consumed Connection Path Length | Get_Attribute_Single | 0 0 0 | C7 | Number of bytes in the consumed_connection_path length attribute |
| 16 0x10 | Consumed Connection Path | Get_Attribute_Single | N/A N/A N/A | A1 01 C7 | Specifies the Application Object(s) that are to receive the data consumed by this Connection Object |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

DeviceNet Connection Class (5) - Polled IO Connection Instance (2)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|-------------------------|----------------------|---------------------------------|--------------|--|
| 1 0x01 | State | Get_Attribute_Single | 0 0 4 | C6 | State of the object |
| 2 0x02 | Instance Type | Get_Attribute_Single | 1 1 1 | C6 | Indicates either I/O or messaging connection 1 = I/O |
| 3 0x03 | Transport Class Trigger | Get_Attribute_Single | 0x83 0x83 0x83 | D1 | Defines Behavior of the connection |
| 4 0x04 | Produced Connection Id | Get_Attribute_Single | N/A 0x3C0 0x3FF | C7 | Placed in CAN Identifier Field when the Connection Transmits |
| 5 0x05 | Consumed Connection Id | Get_Attribute_Single | N/A 0x405 0x5FD | C7 | CAN Identifier Field value that denotes message to be received |

| | | | | | |
|-------------|---------------------------------|---|-------------------|----------|---|
| 6 0x06 | Initial Comm Characteristics | Get_Attribute_Single | 1 1 1 | D1 | Defines the Message Group(s) across which productions and consumptions associated with this |
| 7 0x07 | Produced Connection Size | Get_Attribute_Single | 4 0 6 | C7 | Maximum number of bytes transmitted across this Connection |
| 8 0x08 | Consumed Connection Size | Get_Attribute_Single | 4 0 6 | C7 | Maximum number of bytes received across this Connection |
| 9 0x09 | Expected Packet Rate | Get_Attribute_Single, Set_Attribute_Single | 0 0 65535 | C7 | Defines timing associated with this Connection |
| 12 0x0C | Watchdog Timeout Action | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C6 | Defines how to handle Inactivity/Watchdog timeouts. 1-Auto Delete 3-Deferred Delete An attempt to set this attribute to the value 2 will result in an Invalid Attribute Value error. |
| 13 0x0D | Produced Connection Path Length | Get_Attribute_Single | 6 6 6 | C7 | Number of bytes in the produced_connection_path length attribute |
| 14 0x0E | Produced Connection Path | Get_Attribute_Single | N/A N/A N/A | A1 01 C6 | Application Obj. producing data on this connection |
| 15 0x0F | Consumed Connection Path Length | Get_Attribute_Single | 6 6 6 | C7 | Number of bytes in the consumed_connection_path length attribute |
| 16 0x10 | Consumed Connection Path | Get_Attribute_Single | N/A N/A N/A | A1 01 C7 | Specifies the Application Object(s) that are to receive the data consumed by this Connection Object |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Motor Data Object

Class Code 0x28

Motor Data Object Class (40) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Motor Data" "Motor Data" "Motor Data" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance IDs supported by this class |

Motor Data Object Class (40) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|----------------|----------------------|---------------------------------|--------------|--|
| 3 0x03 | Motor Type | Get_Attribute_Single | 7 7 7 | C6 | Type of Motor Represented by This Instance 0 – Non-standard motor 1 - PM DC Motor 2 - FC DC Motor 3 - PM Synchronous Motor 4 - FC Synchronous Motor 5 - Switched Reluctance Motor 6 - Wound Rotor Induction Motor 7 - Squirrel Cage Induction Motor 8 - Stepper Motor 9 - Sinusoidal PM BL Motor 10 - Trapezoidal PM BL Motor |

| | | | | | |
|-------------|---------------------|---|--------------------|----|---|
| 6 0x06 | RatedCurrent[100mA] | Get_Attribute_Single | 70 0 16000 | C7 | Rated Stator Current Units: [100mA] |
| 7 0x07 | RatedVoltage[V] | Get_Attribute_Single | 230 180 690 | C7 | Rated Base Voltage Units: [V] |
| 9 0x09 | RatedFrequency[Hz] | Get_Attribute_Single | 50 30 500 | C7 | Rated Electrical Frequency Units: [Hz] |
| 12 0x0C | PoleCount[pair*2] | Get_Attribute_Single | 4 2 16 | C7 | Number of poles in the motor |
| 15 0x0F | BaseSpeed[RPM] | Get_Attribute_Single | 1440 1 30000 | C7 | Nominal speed at rated frequency from nameplate Units: [RPM] |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Control Supervisor Object

Class Code 0x29

Control Supervisor Object Class (41) – Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Control Supervisor" "Control Supervisor" "Control Supervisor" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance Ids supported by this class |

Control Supervisor Object Class (41) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|----------------|---|---------------------------------|--------------|---|
| 3 0x03 | Run1 | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C1 | Run Forward Request |
| 4 0x04 | Run2 | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C1 | Run Reverse Request |
| 5 0x05 | NetCtrl | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C1 | Requests Run/Stop control to be local or from network |

| | | | | | |
|-------------|--------------------|---|---------------------|----|---|
| 6 0x06 | State | Get_Attribute_Single | N/A, 0 7 | C6 | State of Control Supervisor Instance 1 = Startup 2 = Not_Ready 3 = Ready 4 = Enabled 5 = Stopping 6 = Fault_Stop 7 = Faulted |
| 7 0x07 | Running1 | Get_Attribute_Single | N/A, 0 1 | C1 | Running Forward Status 0 = Other state 1 = Running Forward |
| 8 0x08 | Running2 | Get_Attribute_Single | N/A, 0 1 | C1 | Running Reverse Status 0 = Other state 1 = Running reverse |
| 9 0x09 | Ready | Get_Attribute_Single | N/A, 0 1 | C1 | Ready to Accept a Run Event 0 = Other state 1 = Ready to accept a Run Event |
| 10 0x0A | Faulted | Get_Attribute_Single | N/A, 0 1 | C1 | Fault Occurred 0 = No faults present 1 = Fault occurred (latched) |
| 11 0x0B | Warning | Get_Attribute_Single | N/A, 0 1 | C1 | Warning Present 0 = No warnings present 1 = Warning present (not latched) |
| 12 0x0C | FaultRst | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C1 | Fault Reset Request 0 = No action 0 -> 1 = Fault reset request 1 = No action |
| 13 0x0D | FaultCode | Get_Attribute_Single | N/A, 0, 65535 | C7 | If in Faulted state, FaultCode indicates the fault that caused the transition to Faulted state. If not in Faulted state, FaultCode indicates the fault that caused the last transition to Faulted state. Fault codes are listed in DeviceNet Volume II, section 6-29.6 |
| 14 0x0E | WarnCode | Get_Attribute_Single | N/A, 0, 65535 | C7 | If in Enabled state, WarnCode indicates the lowest valued warning that caused the Warning bit to be TRUE. Warning codes are listed in DeviceNet Volume II, section 6-29.6 |
| 15 0x0F | CtrlFromNet | Get_Attribute_Single | N/A, 0 1 | C1 | Status of Run/Stop control source 0 = Control is local 1 = Control is from network |
| 16 0x10 | DNFaultMode | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C6 | Action on loss of DeviceNet 0 = Fault and Stop 1 = Ignore 2 = Use preset speed and direction ATTENTION: Ignoring communication faults may result in equipment damage, personal injury, or death. Ensure that you understand how ignoring a communication fault may affect the operation of your system. |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

AC/DC Drive Object

Class Code 0x2A

AC/DC Drive Object Class (42) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|------------------------------|---|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "AC\DC Drive" "AC\DC Drive" "AC\DC Drive" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A N/A N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A N/A N/A | A1 01 C7 | Array of instance IDs supported by this class |

AC/DC Drive Object Class (42) - Instance Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|------------------|---|---------------------------------|--------------|--|
| 3 0x03 | AtReference | Get_Attribute_Single | N/A 0 1 | C1 | 1 = Drive actual at reference (speed or torque reference) based on mode |
| 4 0x04 | NetRef | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C1 | Requests torque or speed reference to be local or from the network 0 = Set Reference not DN Control 1 = Set Reference at DN Control Note that the actual status of torque or speed reference is reflected in attribute 29, RefFromNet |
| 6 | DriveMode | Get_Attribute_Single, | 1 | C6 | 1 = Open loop speed (Frequency) |

| | | | | | |
|------|--|----------------------|---|--|--------------------|
| 0x06 | | Set_Attribute_Single | 1 | | 3 = Torque control |
|------|--|----------------------|---|--|--------------------|

| | | | | | |
|-------------|----------------------|---|--------------------|----|---|
| | | | 3 | | |
| 7 0x07 | SpeedActual[RPM] | Get_Attribute_Single | N/A, 0 30000 | C3 | Actual drive speed (best approximation) Units: RPM |
| 8 0x08 | SpeedRef[RPM] | Get_Attribute_Single, Set_Attribute_Single | 1 1 30000 | C3 | Speed reference Units: RPM |
| 9 0x09 | CurrentActual[100mA] | Get_Attribute_Single | N/A, 0 32767 | C3 | Actual motor phase current Units: 100mA |
| 10 0x0A | CurrentLimit[100mA] | Get_Attribute_Single | N/A, 0 32767 | C3 | Motor phase current limit Units: 100mA |
| 11 0x0B | TorqueActual[Nm] | Get_Attribute_Single | N/A, 0 32767 | C3 | Actual torque Units: Nm |
| 12 0x0C | TorqueRef[Nm] | Get_Attribute_Single, Set_Attribute_Single | 0 0 10000 | C3 | Torque reference Units: Nm |
| 15 0x0F | PowerActual[W] | Get_Attribute_Single | N/A, 0 32767 | C3 | Actual output power Units: Watts |
| 16 0x10 | InputVoltage[V] | Get_Attribute_Single | N/A 180 690 | C3 | Input Voltage Units: Volts |
| 17 0x11 | OutputVoltage[V] | Get_Attribute_Single | N/A 0 690 | C3 | Output Voltage Units: Volts |
| 18 0x12 | AccelTime[64ms] | Get_Attribute_Single | 47 1 46875 | C7 | Acceleration time Time from 0 to HighSpdLimit Units: ms / 64 Attribute 28 (TimeScale) defines scaling factor as 64 |
| 19 0x13 | DecelTime[64ms] | Get_Attribute_Single | 47 1 46875 | C7 | Deceleration time Time from HighSpdLimit to 0 Units: ms / 64 |
| 20 0x14 | LowSpdLimit[RPM] | Get_Attribute_Single | 0 0 30000 | C7 | Minimum speed limit Units: RPM |
| 21 0x15 | HighSpdLimit[RPM] | Get_Attribute_Single | 1800 0 30000 | C7 | Maximum speed limit Units: RPM |
| 29 0x1D | RefFromNet | Get_Attribute_Single | N/A 0 1 | C1 | Status of torque/speed reference 0 = Local torque/speed reference 1 = DeviceNet torque/speed reference |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A N/A N/A | DA | User Supplied name for the Instance. Maximum of 8 characters |

Basic and Motor Control Object

Class Code 0xA0

Basic and Motor Control Class (160) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description Size |
|-----------------|---------------------------|----------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Basic and Motor Control", "Basic and Motor Control", "Basic and Motor Control", | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 01 C7 | Array of instance IDs supported by this class |

Basic and Motor Control Class (160) - Class Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------|--------------------|---|---------------------------------|--------------|-------------|
| 1 0x01 | MinFreq[Hz] | Get_Attribute_Single, Set_Attribute_Single | 0 500 | C7 | |
| 2 | MaxFreq[Hz] | Get_Attribute_Single, Set_Attribute_Single | 50 | C7 | |

| | | | | | |
|------------|----------------------------|---|----------------------|----|--|
| 0x02 | | | 1 500 | | |
| 3 0x03 | AccTime1[100ms] | Get_Attribute_Single, Set_Attribute_Single | 30 1 30000 | C7 | Time from fmin (Minimum Frequency) to fmax (Maximum Frequency) |
| 4 0x04 | DecTime1[100ms] | Get_Attribute_Single, Set_Attribute_Single | 30 1 30000 | C7 | Time from fmax (Maximum Frequency) to fmin (Minimum Frequency) |
| 5 0x05 | RefSelection | Get_Attribute_Single, Set_Attribute_Single | 0 0 13 | C7 | 0 = Vin 3 = Vin - lin 1 = lin 4 = lin - Vin 2 = Vin + lin 5 = Vin * lin 6 = Vin joystick control 7 = lin joystick control 8 = Signal from internal motor pot. 9 = Signal from internal motor pot. reset if unit is stopped 10 = Signal from internal motor pot. (stored in memory over mains break) 11 = Signal from internal motor pot. (stored in memory over mains break) |
| 6 0x06 | JogFrequencyRef | Get_Attribute_Single, Set_Attribute_Single | 50 0 5000 | C7 | |
| 7 0x07 | CurrentLimit[100mA] | Get_Attribute_Single, Set_Attribute_Single | 105 1 175 | C7 | Output current limit [A] of the unit |
| 8 0x08 | V/Hz Selection | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C7 | 0 = Linear 1 = Squared 2 = Programmable U/f ratio |
| 9 0x09 | V/Hz Optimize | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | 0 = None 1 = Automatic torque boost |
| 10 0x0A | MotorVolt[V] | Get_Attribute_Single, Set_Attribute_Single | 230 180 690 | C7 | 230 V VACON CX/CXL/CXS 400 V VACON CX/CXL/CXS 500 V VACON CX/CXL/CXS 690 V VACON CX/CXL/CXS |
| 11 0x0B | MotorFreq[Hz] | Get_Attribute_Single, Set_Attribute_Single | 50 30 500 | C7 | Frequency on the rating plate of the motor |
| 12 0x0C | MotorSpeed[RPM] | Get_Attribute_Single, Set_Attribute_Single | 1440 300 30000 | C7 | Speed (rpm) on the rating plate of the motor |
| 13 0x0D | MotorAmps[100mA] | Get_Attribute_Single, Set_Attribute_Single | 70 1 175 | C7 | Amps on the rating plate of the motor |
| 14 0x0E | SupplyVolt[V] | Get_Attribute_Single, Set_Attribute_Single | x 6 22 | C7 | 230 V VACON CX/CXL/CXS 400 V VACON CX/CXL/CXS 500 V VACON CX/CXL/CXS |

| | | | | | 690 V VACON CX/CXL/CXS |
|------------|------------------------------------|---|------------------|----|--|
| 15 0x0F | GroupVisibility | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | Visibility of the parameters: 0 = All parameter groups visible 1 = Only group 1 is visible |
| 16 0x10 | ProgramLock | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | Disables parameter changes: 0 = Changes enabled 1 = Changes disabled |
| 26 0x1A | Polled Input Assembly Type | Get_Attribute_Single, Set_Attribute_Single | 71 70 73 | C7 | Input assembly used by the polled connection |
| 27 0x1B | Polled Output Assembly Type | Get_Attribute_Single, Set_Attribute_Single | 21 20 23 | C7 | Output assembly used by the polled connection |
| 61 0x3D | ControlMode | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C7 | 0 = Frequency control 1 = Speed control (open loop) 2 = Torque control (open loop) |
| 62 0x3E | Switching-Freq[100Hz] | Get_Attribute_Single, Set_Attribute_Single | 100 10 160 | C7 | Dependant on kW |
| 63 0x3F | Max VoltFreq[Hz] | Get_Attribute_Single, Set_Attribute_Single | 60 30 500 | C7 | |
| 64 0x40 | MaxVolt[%] | Get_Attribute_Single, Set_Attribute_Single | 100 15 200 | C7 | |
| 65 0x41 | Mid V/Hz Freq[Hz*10] | Get_Attribute_Single, Set_Attribute_Single | 0 0 5000 | C7 | |
| 66 0x42 | Mid V/Hz Volt[%*100] | Get_Attribute_Single, Set_Attribute_Single | 0 0 10000 | C7 | |
| 67 0x43 | Zero FreqVolt[%*100] | Get_Attribute_Single, Set_Attribute_Single | 0 0 4000 | C7 | |
| 68 0x44 | Overvolt Controller | Get_Attribute_Single, Set_Attribute_Single | 1 0 1 | C7 | 0 = Controller is not operating 1 = Controller is operating |

| | | | | | |
|-------------|-----------------------------|---|---------------------|----|--|
| 69 0x45 | Undervolt Controller | Get_Attribute_Single, Set_Attribute_Single | 1 0 1 | C7 | 0 = Controller is not operating 1 = Controller is operating |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A, N/A, N/A | DA | Array of instance IDs supported by this class |

Input and Fieldbus Object

Class Code 0xA1

Input and Fieldbus Control Class (161) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|----------------------------------|---|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Input and Fieldbus Control", " Input and Fieldbus Control", " Input and Fieldbus Control " | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 01 C7 | Array of instance IDs supported by this class |

Input and Fieldbus Control Class (161) - Class Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|------|----------------------------|---|---------------------------------|--------------|---|
| 0x01 | 1 Start/Stop Select | Get_Attribute_Single, Set_Attribute_Single | 0 0 4 | C7 | DIA1 = Start forward 1 = Start/Stop 2 = Start/Stop 3 = Start pulse 4 = Start/stop pulse DIA2 Start reverse Reverse Run enable Stop pulse Run enable |
| 0x02 | 2 DIA3Function | Get_Attribute_Single, Set_Attribute_Single | 7 0 11 | C7 | 0 = Not used = Ext. fault, closing contact 2 = External fault, opening contact 3 = Run enable 4 = Acc./dec. time selection 5 = Reverse 6 = Jogging speed 7 = Fault reset 8 = Acc./dec. operation prohibit 9 = DC-braking command 10 = Torque control |
| 0x03 | 3 DIB4Function | Get_Attribute_Single, Set_Attribute_Single | 6 0 11 | C7 | 0 = Not used = Ext. fault, closing contact 2 = External fault, opening contact 3 = Run enable 4 = Acc./dec. time selection 5 = Reverse 6 = Jogging speed 7 = Fault reset 8 = Acc./dec. operation prohibit 9 = DC-braking command 10 = Multi-Step speed select 1 |
| 0x04 | 4 DIB5Function | Get_Attribute_Single, Set_Attribute_Single | 1 0 11 | C7 | 0 = Not used = Ext. fault, closing contact 2 = External fault, opening contact 3 = Run enable 4 = Acc./dec. time selection 5 = Reverse 6 = Jogging speed 7 = Fault reset 8 = Acc./dec. operation prohibit 9 = DC-braking command 10 = Multi-Step speed select 2 |
| 0x05 | 5 DIB6Function | Get_Attribute_Single, Set_Attribute_Single | 4 0 11 | C7 | 0 = Not used = Ext. fault, closing contact 2 = External fault, opening contact 3 = Run enable 4 = Acc./dec. time selection 5 = Reverse 6 = Jogging speed 7 = Fault reset 8 = Acc./dec. operation prohibit 9 = DC-braking command 10 = Multi-Step speed select 3 11 = Motorised pot. speed down |
| 0x06 | 6 Vin TypeSelect | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C7 | 0 = 0—10 V 1 = Custom setting range 2 = -10—+10 V (can be used only with Joystick control) |

| | | | | | |
|------|---------------------------------|---|--------------------------|----|--|
| 0x07 | 7 Custom Vin-Min[%*100] | Get_Attribute_Single, Set_Attribute_Single | 0 0 10000 | C7 | |
| 0x08 | 8 Custom Vin-Max[%*100] | Get_Attribute_Single, Set_Attribute_Single | 10000 0 10000 | C7 | |
| 0x09 | 9 Vin Inversion | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | 0 = Not inverted 1 = Inverted |
| 0x0A | 10 Vin Filter-Time[10ms] | Get_Attribute_Single, Set_Attribute_Single | 10 0 1000 | C7 | 0 = No filtering |
| 0x0B | 11 Iin TypeSelect | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C7 | 0 = 0—20 mA 1 = 4—20 mA 2 = Custom setting range |
| 0x0C | 12 Custom Iin-Min[%*100] | Get_Attribute_Single, Set_Attribute_Single | 0 0 10000 | C7 | |
| 0x0D | 13 Custom Iin-Max[%*100] | Get_Attribute_Single, Set_Attribute_Single | 10000 0 10000 | C7 | |
| 0x0E | 14 Iin Inversion | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | 0 = Not inverted 1 = Inverted |
| 0x0F | 15 Iin Filter-Time[10ms] | Get_Attribute_Single, Set_Attribute_Single | 10 0 1000 | C7 | 0 = No filtering |
| 0x10 | 16 Vin MinScale[%] | Get_Attribute_Single, Set_Attribute_Single | 0 -32000 32000 | C3 | 0% = no minimum scaling |
| 0x11 | 17 Vin Max-Scale[100%] | Get_Attribute_Single, Set_Attribute_Single | 10000 -32000 32000 | C3 | 100% = no maximum scaling |
| 0x12 | 18 Iin MinScale[%] | Get_Attribute_Single, Set_Attribute_Single | 0 -32000 32000 | C3 | 0% = no minimum scaling |
| 0x13 | 19 Iin MaxScale[100%] | Get_Attribute_Single, Set_Attribute_Single | 10000 -32000 32000 | C3 | 100% = no maximum scaling |

| | | | | | | |
|-------------|------------------------|---|---------------------|----|--|---|
| 20 0x14 | Analog InSelect | Get_Attribute_Single, Set_Attribute_Single | 0 0 4 | C7 | 0 = Not use = Vin (analog voltage input) 2 = Iin (analog current input) 3 = Ain1 (option board) 4 = Ain2 (option board) | 1 |
| 21 0x15 | Analog InFunc | Get_Attribute_Single, Set_Attribute_Single | 0 0 4 | C7 | 0 = No function = Reduces current limit (par. 1.7) 2 = Reduces DC-braking current 3 = Reduces acc. and decel. times 4 = Reduces torque supervis. limit | 1 |
| 51 0x33 | FieldbusSelect | Get_Attribute_Single, Set_Attribute_Single | 1 0 1 | C7 | 0 = Control via I/O terminals 1 = Control via Fieldbus board | |
| 52 0x34 | DIC1Function | Get_Attribute_Single, Set_Attribute_Single | 1 0 1 | C7 | 0 = Fieldbus control 1 = External fault | |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A, N/A, N/A | DA | Array of instance Ids supported by this class | |

Output and Supervision Object

Class Code 0xA2

Output and Supervision Class (162) – Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|----------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 1 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Output and Supervision", "Output and Supervision", "Output and Supervision" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 01 C7 | Array of instance IDs supported by this class |

Output and Supervision Class (162) - Class Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|------|---------------------------------|---|---------------------------------|--------------|--|
| 0x01 | 1 AoutFunction | Get_Attribute_Single, Set_Attribute_Single | 1 0 11 | C7 | 0 = Not used 1 = O/P frequency (0—fmax) 2 = Motor speed (0—max. speed) 3 = O/P current (0—2.0 x InCX) 4 = Motor torque (0—2 x TnCX) 5 = Motor power (0—2 x PnCX) 6 = Motor voltage (0—100% x UnM) 7 = DC-link volt. 8 = Input signal Vin 9 = Input signal lin 10 = Reference frequency 11 = Reference torque |
| 0x02 | 2 Aout Filter-Time[10ms] | Get_Attribute_Single, Set_Attribute_Single | 100 1 1000 | C7 | |
| 0x03 | 3 AoutInversion | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | 0 = Not inverted 1 = Inverted |
| 0x04 | 4 AoutMinimum | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | 0 = 0 mA 1 = 4 mA |
| 0x05 | 5 AoutScale[%] | Get_Attribute_Single, Set_Attribute_Single | 100 10 1000 | C7 | |
| 0x06 | 6 DoutFunction | Get_Attribute_Single, Set_Attribute_Single | 1 0 22 | C7 | 0 = Not used 1 = Ready 2 = Run 3 = Fault 4 = Fault inverted 5 = VACON overheat warning 6 = External fault or warning 7 = Reference fault or warning 8 = Warning 9 = Reversed 10 = Jogging speed selected 11 = At speed 12 = Motor regulator activated 13 = Output freq. limit superv. 1 14 = Output freq. limit superv. 2 15 = Torque limit supervision 16 = Reference limit supervision 17 = External brake control 18 = Control from I/O terminals 19 = Frequency converter temperature limit supervision 20 = Unrequested rotation direction 21 = External brake control inverted 22 = Termistor fault or warning |
| 0x07 | 7 Rout1Function | Get_Attribute_Single, Set_Attribute_Single | 2 0 21 | C7 | As attribute 6 |
| | 8 Rout2Function | Get_Attribute_Single, | 3 | C7 | As attribute 6 |

| | | | | | |
|------|-------------------------------|-----------------------|---------------|----|---|
| 0x08 | | Set_Attribute_Single | 0 21 | | |
| 9 | Freq1SuperFunc | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Low limit 2 = High limit |
| 0x09 | | Set_Attribute_Single | 0 2 | | |
| 10 | Freq1SuperValue[Hz*10] | Get_Attribute_Single, | 0 | C7 | |
| 0x0A | | Set_Attribute_Single | 0 5000 | | |
| 11 | Freq2SuperFunc | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Low limit 2 = High limit |
| 0x0B | | Set_Attribute_Single | 0 2 | | |
| 12 | Freq2SuperValue[Hz*10] | Get_Attribute_Single, | 0 | C7 | |
| 0x0C | | Set_Attribute_Single | 0 5000 | | |
| 13 | TorqueSuperFunc | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Low limit 2 = High limit |
| 0x0D | | Set_Attribute_Single | 0 2 | | |
| 14 | TorqueSuper-Value[%] | Get_Attribute_Single, | 1000 | C7 | |
| 0x0E | | Set_Attribute_Single | -2000 2000 | | |
| 15 | RefSuperFunc | Get_Attribute_Single, | 1 | C7 | 0 = No 1 = Low limit 2 = High limit |
| 0x0F | | Set_Attribute_Single | 0 2 | | |
| 16 | RefSuper-Value[Hz*10] | Get_Attribute_Single, | 0 | C7 | |
| 0x10 | | Set_Attribute_Single | 0 5000 | | |
| 17 | EB Off-delay[100ms] | Get_Attribute_Single, | 5 | C7 | |
| 0x11 | | Set_Attribute_Single | 0 1000 | | |
| 18 | EB On-delay[100ms] | Get_Attribute_Single, | 15 | C7 | |
| 0x12 | | Set_Attribute_Single | 0 1000 | | |
| 19 | TempSuperFunc | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Low limit 2 = High limit |
| 0x13 | | Set_Attribute_Single | 0 2 | | |

| | | | | | |
|------|----------------------------|-----------------------|-------------|----|---|
| 20 | TempSuper-Value[oC] | Get_Attribute_Single, | 40 | C3 | Unit is Degree Centigrade |
| 0x14 | | Set_Attribute_Single | -10 75 | | |
| 176 | User Label | Get_Attribute_Single, | N/A, | DA | Array of instance IDs supported by this class |
| 0xB0 | | Set_Attribute_Single | N/A, N/A | | |

Drive and Torque Control Object

Class Code 0xA3

Drive and Torque Control Class (163) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-----------------|---------------------------|----------------------------------|---|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 65535 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Drive and Torque Control", "Drive and Torque Control", "Drive and Torque Control", | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 01 C7 | Array of instance IDs supported by this class |

Drive and Torque Control Class (163) - Class Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|------|---------------------|---|---------------------------------|--------------|--|
| 0x01 | 1 Ramp1 | Get_Attribute_Single, Set_Attribute_Single | 0 0 100 | C7 | 0 = Linear >0 = S-curve acc./dec. time |
| 0x02 | 2 Ramp2 | Get_Attribute_Single, Set_Attribute_Single | 0 0 100 | C7 | 0 = Linear >0 = S-curve acc./dec. time |
| 0x03 | 3 AccTime2 | Get_Attribute_Single, Set_Attribute_Single | 100 1 30000 | C7 | |
| 0x04 | 4 DecTime2 | Get_Attribute_Single, Set_Attribute_Single | 100 1 30000 | C7 | |
| 0x05 | 5 BrakeChop | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C7 | 0 = Brake chopper not in use 1 = Brake chopper in use 2 = External brake chopper |
| 0x06 | 6 StartFn | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | 0 = Ramp 1 = Flying start |
| 0x07 | 7 StopFn | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | 0 = Coasting 1 = Ramp |
| 0x08 | 8 DCBAmps | Get_Attribute_Single, Set_Attribute_Single | N/A, N/A, NA | C7 | |
| 0x09 | 9 DCBStopT | Get_Attribute_Single, Set_Attribute_Single | 0 0 2500 | C7 | 0 = DC-brake is off at Stop |
| 0x0A | 10 DCBStopFn | Get_Attribute_Single, Set_Attribute_Single | 15 1 100 | C7 | |
| 0x0B | 11 DCBStartT | Get_Attribute_Single, Set_Attribute_Single | 0 0 2500 | C7 | 0 = DC-brake is off at Start |
| 0x0C | 12 Preset1 | Get_Attribute_Single, Set_Attribute_Single | 100 0 5000 | C7 | |
| 0x0D | 13 Preset2 | Get_Attribute_Single, Set_Attribute_Single | 150 0 5000 | C7 | |

| | | | | | |
|------|------------------|-----------------------|-------------|----|----------------------------|
| 14 | Preset3 | Get_Attribute_Single, | 200 | C7 | |
| 0x0E | | Set_Attribute_Single | 0 5000 | | |
| 15 | Preset4 | Get_Attribute_Single, | 250 | C7 | |
| 0x0F | | Set_Attribute_Single | 0 5000 | | |
| 16 | Preset5 | Get_Attribute_Single, | 300 | C7 | |
| 0x10 | | Set_Attribute_Single | 0 5000 | | |
| 17 | Preset6 | Get_Attribute_Single, | 400 | C7 | |
| 0x12 | | Set_Attribute_Single | 0 5000 | | |
| 18 | Preset7 | Get_Attribute_Single, | 500 | C7 | |
| 0x13 | | Set_Attribute_Single | 0 5000 | | |
| 51 | TqRefSel | Get_Attribute_Single, | 0 | C7 | 0 = None |
| 0x33 | | Set_Attribute_Single | 0 2 | | 1 = Vin 2 = lin |
| 52 | TqBias | Get_Attribute_Single, | 0 | C3 | 0 = not in use |
| 0x34 | | Set_Attribute_Single | -100 100 | | |
| 53 | TqGain | Get_Attribute_Single, | 100 | C3 | 100 = no scaling |
| 0x35 | | Set_Attribute_Single | -320 320 | | |
| 54 | TqTC | Get_Attribute_Single, | 128 | C7 | |
| 0x36 | | Set_Attribute_Single | 1 1000 | | |
| 55 | TqMin | Get_Attribute_Single, | 300 | C7 | |
| 0x37 | | Set_Attribute_Single | 1 1000 | | |
| 101 | Trail# | Get_Attribute_Single, | 0 | C7 | 0 = not in use |
| 0x65 | | Set_Attribute_Single | 0 10 | | |
| 102 | TrialT | Get_Attribute_Single, | 30 | C7 | |
| 0x66 | | Set_Attribute_Single | 1 6000 | | |
| 103 | StartFn | Get_Attribute_Single, | 0 | C7 | 0 = Ramp = Flying start |
| 0x67 | | Set_Attribute_Single | 0 1 | | 1 |
| 104 | UVRestart | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Yes |

| | | | | | |
|------|--------------------|-----------------------|-------------|----|---|
| 0x68 | | Set_Attribute_Single | 0 1 | | |
| 105 | OVRestart | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Yes |
| 0x69 | | Set_Attribute_Single | 0 1 | | |
| 106 | OCRestart | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Yes |
| 0x6A | | Set_Attribute_Single | 0 1 | | |
| 107 | RefRestart | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Yes |
| 0x6B | | Set_Attribute_Single | 0 1 | | |
| 108 | TempRestart | Get_Attribute_Single, | 0 | C7 | 0 = No 1 = Yes |
| 0x6C | | Set_Attribute_Single | 0 1 | | |
| 176 | User Label | Get_Attribute_Single, | N/A, | DA | Array of instance IDs supported by this class |
| 0xB0 | | Set_Attribute_Single | N/A, N/A | | |

Protections Object

Class Code 0xA6

Protections Class (166) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|----------------------------------|---|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 65535 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Protections", "Protections", "Protections" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 01 C7 | Array of instance IDs supported by this class |

Protections Class (166) - Class Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|------|------------------------|---|---------------------------------|--------------|---|
| 0x01 | 1 ResFlt | Get_Attribute_Single, Set_Attribute_Single | 0 0 3 | C7 | 0 = No action 1 = Warning par 4.7 2 = Fault, stop according to 3 = Fault, stop always by coasting |
| 0x02 | 2 ExtFlt | Get_Attribute_Single, Set_Attribute_Single | 2 0 3 | C7 | 0 = No action 1 = Warning par 4.7 2 = Fault, stop according to 3 = Fault, stop always by coasting |
| 0x03 | 3 PhaseSuper | Get_Attribute_Single, Set_Attribute_Single | 2 0 2 | C7 | 0 = No action 2 = Fault |
| 0x04 | 4 EarthFlt | Get_Attribute_Single, Set_Attribute_Single | 2 0 2 | C7 | 0 = No action 2 = Fault |
| 0x05 | 5 TempProtect | Get_Attribute_Single, Set_Attribute_Single | 2 0 2 | C7 | 0 = No action 1 = Warning 2 = Fault |
| 0x06 | 6 TempBreakPtA | Get_Attribute_Single, Set_Attribute_Single | 1000 500 1500 | C7 | 2 |
| 0x07 | 7 TempZeroHzA | Get_Attribute_Single, Set_Attribute_Single | 450 50 500 | C7 | 2 |
| 0x08 | 8 TempTC | Get_Attribute_Single, Set_Attribute_Single | N/A 5 3000 | C7 | Default value is set according to motor nominal current |
| 0x09 | 9 TempBreakPtHz | Get_Attribute_Single, Set_Attribute_Single | 35 10 500 | C7 | |
| 0x0A | 10 StallProtect | Get_Attribute_Single, Set_Attribute_Single | 1 0 2 | C7 | 0 = No action 1 = Warning 2 = Fault |
| 0x0B | 11 StallA | Get_Attribute_Single, Set_Attribute_Single | 1300 50 2000 | C7 | |
| 0x0C | 12 StallT | Get_Attribute_Single, Set_Attribute_Single | 150 20 1200 | C7 | |

| | | | | | |
|------|--------------------|-----------------------|-------------|----|-----------------------------------|
| 13 | MaxStallHz | Get_Attribute_Single, | 25 | C7 | |
| 0x0D | | Set_Attribute_Single | 1 500 | | |
| 14 | ULProtect | Get_Attribute_Single, | 0 | C7 | 0 = No action |
| 0x0E | | Set_Attribute_Single | 0 2 | | 1 = Warning 2 = Fault |
| 15 | ULFWTq | Get_Attribute_Single, | 500 | C7 | |
| 0x0F | | Set_Attribute_Single | 100 1500 | | |
| 16 | ULZeroHzTq | Get_Attribute_Single, | 100 | C7 | |
| 0x10 | | Set_Attribute_Single | 50 1500 | | |
| 17 | ULTime | Get_Attribute_Single, | 200 | C7 | |
| 0x11 | | Set_Attribute_Single | 20 6000 | | |
| 18 | SupplySuper | Get_Attribute_Single, | 2 | C7 | |
| 0x12 | | Set_Attribute_Single | 0 2 | | |
| 19 | ThermSuper | Get_Attribute_Single, | 2 | C7 | 0 = No action |
| 0x13 | | Set_Attribute_Single | 0 2 | | 1 = Warning 2 = Fault |
| 20 | FbusFlt | Get_Attribute_Single, | 0 | C7 | 0 = No action |
| 0x14 | | Set_Attribute_Single | 0 2 | | 1 = Warning 2 = Fault |
| 51 | SkipHzL1 | Get_Attribute_Single, | 0 | C7 | |
| 0x33 | | Set_Attribute_Single | 0 5000 | | |
| 52 | SkipHzH1 | Get_Attribute_Single, | 0 | C7 | 0 = Skip Frequency range 1 is off |
| 0x34 | | Set_Attribute_Single | 0 5000 | | |
| 53 | SkipHzL2 | Get_Attribute_Single, | 0 | C7 | |
| 0x35 | | Set_Attribute_Single | 0 5000 | | |
| 54 | SkipHzH2 | Get_Attribute_Single, | 0 | C7 | 0 = Skip Frequency range 2 is off |
| 0x36 | | Set_Attribute_Single | 0 5000 | | |

| | | | | | |
|-------------|------------------------|---|-------------------------|----|---|
| 55 0x37 | SkipHzL3 | Get_Attribute_Single, Set_Attribute_Single | 0 0 5000 | C7 | |
| 56 0x38 | SkipHzH3 | Get_Attribute_Single, Set_Attribute_Single | 0 0 5000 | C7 | 0 = Skip Frequency range 3 is off |
| 151 0x97 | Safe State Type | Get_Attribute_Single, Set_Attribute_Single | 0 0 2 | C7 | <p>Selects Safe State response to errors which specify safe state operation. Currently only a loss of connection other than by de-allocation is a safe state error.</p> <p>Warning: Review the application for safe operation before specifying a value for this attribute.</p> <p>0 = DriveFault (fault and stop) 1 = No Action (hold last speed) 2 = Preset Speed/Direction</p> |
| 152 0x98 | PresetDir | Get_Attribute_Single, Set_Attribute_Single | 0 0 1 | C7 | <p>Sets safe state direction of rotation if the Safe State Behavior attribute specifies "Preset Speed/Direction".</p> <p>Warning: Review the application for safe operation before specifying a value for this attribute.</p> <p>Inverter will require external stop.</p> <p>0 = Forward 1 = Reverse</p> |
| 153 0x99 | PresetRPM | Get_Attribute_Single, Set_Attribute_Single | 0 0 30000 | C7 | <p>Sets safe state speed reference (RPM) if the Safe State Behavior attribute specifies "Preset Speed/Direction".</p> <p>Warning: Review the application for safe operation before specifying a value for this attribute.</p> <p>Inverter will require external stop.</p> |
| 154 0x9A | PresetTq | Get_Attribute_Single, Set_Attribute_Single | 0 0 10000 | C7 | <p>Sets safe state torque reference (0,00%) if the Safe State Behavior attribute specifies "Preset Speed/Direction".</p> <p>Warning: Review the application for safe operation before specifying a value for this attribute.</p> <p>Inverter will require external stop.</p> |
| 176 0xB0 | User Label | Get_Attribute_Single, Set_Attribute_Single | N/A, N/A, N/A | DA | Array of instance IDs supported by this class |

Monitoring Data Object

Class Code 0xAA

Monitoring Data Class (170) - Class Attributes (0)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|-------------|---------------------------|----------------------------------|--|-------------------------------------|--|
| 1 0x01 | Revision | Get_Attribute_Single | 1 1 65535 | C7 | Revision of this object |
| 2 0x02 | Max Instance | Get_Attribute_Single | 1 1 1 | C7 | |
| 3 0x03 | Number of Instances | Get_Attribute_Single | 1 1 1 | C7 | |
| 4 0x04 | Optional attribute list | Get_Attribute_Single | {1,176} {1,176} {1,176} | A2 04 C7 A1 01 C7 | |
| 5 0x05 | Optional service list | Get_Attribute_Single | {1,16} {1,16} {1,16} | A2 04 C7 A1 01 C7 | |
| 6 0x06 | Max Class Attribute ID | Get_Attribute_Single | 190 190 190 | C7 | |
| 7 0x07 | Max Instance Attribute ID | Get_Attribute_Single | 176 176 176 | C7 | |
| 176 0xB0 | Object Name | Get_Attribute_Single | "Monitoring Data" "Monitoring Data" | DA | ASCII Name for the object Class |
| 180 0xB4 | Class Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes a class attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 186 0xBA | Instance Attribute List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 08 A2 06 C7 DA DA A1 01 C6 | Each Element describes an instance attribute. The Array's elements are structs as described in the semantics section. Individual elements are accessed using the Get Member service. |
| 190 0xBE | Instance ID List | Get Member, CH_Get_Member | N/A, N/A, N/A | A1 01 C7 | Array of instance IDs supported by this class |

Monitoring Data Object Class (170) - Class Attributes (1)

| # | Attribute Name | Services | Default, Minimum, Maximum | Data Type | Description |
|------|------------------|---|---------------------------------|--------------|--|
| 0x01 | 1 OutputHz | Get_Attribute_Single | N/A, 0, 500 | C7 | Frequency to the motor |
| 0x02 | 2 MotorRPM | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 30000 | C7 | Calculated motor speed |
| 0x03 | 3 MotorAmps | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 160 | C7 | Measured motor current |
| 0x04 | 4 MotorTorque[%] | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, N/A | C7 | Calculated actual torque/nominal torque of the unit |
| 0x05 | 5 MotorPower[%] | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, N/A | C7 | Calculated actual power/nominal power of the unit power of the unit |
| 0x06 | 6 MotorVolts | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 690 | C7 | Calculated motor voltage |
| 0x07 | 7 DCLinkVolts | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, N/A | C7 | Measured DC-link voltage |
| 0x08 | 8 TempC | Get_Attribute_Single, Set_Attribute_Single | N/A, N/A, N/A | C7 | Temperature of the heat sink |
| 0x09 | 9 OpDayCount | Get_Attribute_Single, Set_Attribute_Single | N/A, N0, 65535 | C7 | Operating days 1), not resetable |
| 0x0A | 10 OpHrCount | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 65535 | C7 | Operating hours 2), can be reset with program-button #3 |
| 0x0B | 11 MwhCount | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 65535 | C7 | Total MW-hours, not resetable |
| 0x0C | 12 MwhTripCount | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 65535 | C7 | MW-hours, can be reset with program-mable button #4 |
| 0x0D | 13 VinVolts | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 10 | C7 | Voltage of the terminal Vin+ (control board) |
| 0x0E | 14 linmA | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 20 | C7 | Current of terminals lin+ and lin- (control board) |
| 0x0F | 15 DIAStatus | Get_Attribute_Single, Set_Attribute_Single | N/A, 0, 7 | C7 | 0 = Open Input, 1 = Closed Input (Active) |
| 16 | DIBStatus | Get_Attribute_Single, | N/A, | C7 | 0 = Open Input, 1 = Closed Input (Active) |

| | | | | | |
|------|-------------------|-----------------------|-------------|----|---|
| 0x10 | | Set_Attribute_Single | 0, 7 | | |
| 17 | OutStatus | Get_Attribute_Single, | N/A, | C7 | 0 = Open Input, 1 = Closed Input (Active) |
| 0x11 | | Set_Attribute_Single | 0, 7 | | |
| 18 | ControlProg | Get_Attribute_Single, | N/A, | C7 | Version number of the control software |
| 0x12 | | Set_Attribute_Single | 0, 65535 | | |
| 19 | NomPower | Get_Attribute_Single, | N/A, | C7 | Shows the power size of the unit |
| 0x13 | | Set_Attribute_Single | 1, 1000 | | |
| 20 | MotorTemp[%] | Get_Attribute_Single, | N/A, | C7 | 100%= temperature of motor has risen to nominal value |
| 0x14 | | Set_Attribute_Single | 0, N/A | | |
| 21 | HzRef | Get_Attribute_Single, | N/A, | C7 | Frequency reference |
| 0x15 | | Set_Attribute_Single | 0, 500 | | |
| 22 | TorqueRef | Get_Attribute_Single, | N/A, | C7 | Torque reference when torque control in use |
| 0x16 | | Set_Attribute_Single | 0, N/A | | |
| 51 | E1 | Get_Attribute_Single, | N/A, | C7 | |
| 0x33 | | Set_Attribute_Single | 0, 65535 | | |
| 52 | E2 | Get_Attribute_Single, | N/A, | C7 | |
| 0x34 | | Set_Attribute_Single | 0, 65535 | | |
| 53 | E3 | Get_Attribute_Single, | N/A, | C7 | |
| 0x35 | | Set_Attribute_Single | 0, 65535 | | |
| 54 | E4 | Get_Attribute_Single, | N/A, | C7 | |
| 0x36 | | Set_Attribute_Single | 0, 65535 | | |
| 55 | E5 | Get_Attribute_Single, | N/A, | C7 | |
| 0x37 | | Set_Attribute_Single | 0, 65535 | | |
| 56 | E6 | Get_Attribute_Single, | N/A, | C7 | |
| 0x38 | | Set_Attribute_Single | 0, 65535 | | |
| 57 | E7 | Get_Attribute_Single, | N/A, | C7 | |
| 0x39 | | Set_Attribute_Single | 0, 65535 | | |
| 58 | E8 | Get_Attribute_Single, | N/A, | C7 | |
| 0x3A | | Set_Attribute_Single | 0, 65535 | | |
| 59 | EC | Get_Attribute_Single, | N/A, | C7 | |
| 0x3B | | Set_Attribute_Single | 0, 65535 | | |
| 176 | User Label | Get_Attribute_Single, | N/A, | DA | Array of instance IDs supported by this class |
| 0xB0 | | Set_Attribute_Single | N/A, N/A | | |



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